

REMARKS

The Non-Final Office Action dated December 24, 2009, has been carefully considered and reconsideration of the application in view of the present submission is respectfully requested. Claims 12-19 are previously pending in the present application. Of the above claims, claims 12-19 have been canceled. Applicants have added new claims 20-25 to better define the present invention. Support for the claim amendments may be found in the specification and the original claims. For example, the term “producing a crude titanium tetrachloride comprising vanadium and aluminum chloride” is found on page 1, lines 20-23; support for the term “produced from a carbochlorination of a titanium-containing material” is found in claim 12; support for the term “mixing the crude titanium tetrachloride with an organic oil that acts as a vanadium passivating agent to create a product is found in the original claims and page 5, lines 27-30; support for the term “mixing the product with the crude titanium tetrachloride in step a, wherein the product results in the passivation of the aluminum chloride of the crude titanium tetrachloride” is found on page 5, lines 27-30 and page 6, lines 34-37; support for the term “forming an easy-to-separate vanadium compound and an easy-to-separate aluminum-containing compound” is found on page 3, lines 18-24; support for the term “separating the easy-to-separate vanadium compound and the easy-to-separate aluminum-containing compound to form a purified titanium tetrachloride” is in original claim 1; and support for claims 21 through 26 is found in claims 13 through 19.

Claims 12-19 are rejected by the Examiner under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The Examiner indicated the claim(s) contain subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Specifically, that there is no sufficient support in the instant application for the limitation, “the crude titanium discharge being free of aluminum passivating agent.” Applicants have cancelled claims 12-19, and have added new claims that do not include this language.

Claims 12-19 are rejected by the Examiner under 35 U.S.C. 103(a) as being unpatentable over the admitted prior art (the preamble of the Jepson claim 12) or GB 744,074 either one in view of Cronin (Cronin ‘182, 2001/0016182) and optionally further in view of Robinson (4,246,022). As observed in claim 20, the process of the present invention begins with a crude titanium tetrachloride prepared from carbochlorination. A crude titanium

tetrachloride is described on page 1, lines 13 to 17 of the specification as “In the production of titanium tetrachloride, raw materials, including ilmenite or rutile ores or other titanium-containing materials such as those obtained from beneficiating these ores, are reacted with chlorine and carbon (carbochlorination) to yield a mixture of metal chlorides in a crude titanium tetrachloride.” GB 744,074 also defines crude titanium tetrachloride on lines 27-36. This crude titanium tetrachloride is then mixed with an oil acting as a vanadium passivating agent to create a “product” as described in step b of claim 20. Step b is not similar to that taught in GB 744,074. GB 744,074 specifically describes refluxing animal waxes with crude titanium tetrachloride to rid the crude titanium tetrachloride specifically of vanadium (Page 2 of '074, Column 1, lines 25-49). Step c of the process of the present invention, mixes a “product” (i.e. composed of reactants and products) with crude titanium tetrachloride and that the “product” now acts as an aluminum chloride passivating agent even though the “product’s” starting materials acted as a vanadium passivating agent. The “product” is not like the animal wax taught in GB 744,074 in that it consists of reactants and products of step b. It is preferred that step a and step b occur in different locations. The “product” of step b is preferably reintroduced with the crude titanium tetrachloride of step a. None of the references cited by the Examiner teaches or motivates one skilled in the art to reuse a “product” or that a “product” as taught in the present invention acts as an aluminum chloride passivating agent. Example 1 demonstrates that substantially all of the AlCl_3 was removed by the process of the present invention.

Applicants disagree with the Examiner’s statement that GB 744,074 teaches that refluxing animal waxes with crude titanium tetrachloride will purify the crude titanium tetrachloride of alumina chloride. On page 2, column 1, line 50 to column 2, line 70 of GB 744,074 teaches that the “principle impurity in the residue at the bottom of the still is vanadium. The aforesaid relatively hard granular residue comprises titanium dioxide, vanadium, and small amounts of silica, alumina, tungsten, niobium, and other impurities.” As mentioned above, and unlike the GB 744,074 process, the process of the present invention takes the “product” (i.e. step b, claim 20) and mixes with crude titanium tetrachloride in step a. GB '074 teaches a relatively basic (1953) understanding of vanadium oxychloride (VOCl_3) removal. This patent refers only to the purification of crude TiCl_4 through refluxing with animal waxes to remove vanadium containing impurities. While the patent mentions the presence of other metal chlorides (column 1 line 39), the example and text only refer to the

removal of VOCl_3 . No mention of Aluminum chloride passivation or further reaction of the "spent" animal wax residue with crude TiCl_4 is mentioned.

Applicants were surprised by the unexpected result that this "product," produced from oil and crude titanium tetrachloride in step b, acts as a aluminum chloride passivating agent when mixed with crude titanium tetrachloride. Applicants surprise at this unexpected result is described on page 5, lines 27-29 of the specification stating "Surprisingly, it has been found that the product of the passivation of vanadium oxychloride in crude titanium tetrachloride discharge with an organic oil is a passivating agent for aluminum chloride." GB 744, 074 clearly teaches away from this unexpected result by stating small amount of alumina is removed by refluxing an animal wax with crude titanium tetrachloride. In addition, GB 744,074 is teaching the use of animal wax as a vanadium passivating agent, and the present invention is teaching the use of a "product" (i.e. composed of many things) as an aluminum chloride passivating agent. Example 1 demonstrates that substantially all of the AlCl_3 was removed by the "product" of the present invention.

The cited prior art does not teach a process of taking a "product" where some of the starting materials of the "product" acts as a vanadium passivating agent and then mixing the "product" with a crude titanium tetrachloride to remove aluminum chloride. The cited prior art does not teach the components of the "product", that is, a mixture of reactants and products. The cited prior art does not teach or suggest the unexpected result that the "product" where some of the starting materials acted as a vanadium passivating agent, will act as an aluminum passivating agent.

In addition, the Examiner sites Robinson '022 on page 7 of the Office Action referring to Column 1, lines 38-43, in which Robinson describes the removal of aluminum, niobium and vanadium chlorides with Mineral oil. The Examiner then concludes that Robinson '022 "clearly teaches that the Mineral Oil can remove both vanadium and aluminum impurities from titanium tetrachloride". However, closer examination of the text shows that Robinson '022 does not claim that the Mineral Oil passivates or reacts with the metal chlorides merely that the interaction with Mineral Oil "removes" the metal chlorides. Robinson '022 claims that contacting Mineral oil and titanium tetrachloride results in a "mineral oil sludge residue often containing aluminum chloride, niobium chloride and vanadium chloride thereby being produced." In fact, review of the Robinson '022 text shows that the patent concerns the recovery of high value metal chlorides from the Chloride process. For the process, as described in Robinson '022, to work properly, the minor metal chlorides must be recovered,

without reaction, in the chloride form (see Column 1, line 50). Compared with Claim 20, Robinson '022 teaches away from the "passivation" or chemical reaction of Aluminum chloride to a non-corrosive easily to separate material.

Frey '021 is also an older reference that claims removal of coloring impurities through addition of oils or fats followed by distillation. AlCl_3 is not mentioned in this patent nor is the formation of TiOCl_2 as a by-product of reaction with fats and oils. No mention of optimizing this process through measurements of TiOCl_2 .

The Kay '881 patent (1952) is focused on the passivation of AlCl_3 through reaction with water at elevated temperature. The removal of VOCl_3 is mentioned in two of the examples and only with respect to the use of finely-divided copper as a means to remove it from the crude TiCl_4 product. No mention of the potential for oils or waxes (to remove VOCl_3) that might generate TiOCl_2 that could then be used to react with AlCl_3 .

Cronin (6,562,312) describes process control scheme to optimize the passivation of AlCl_3 using an on-line Infrared measurement. Treatment of VOCl_3 is not mentioned in the patent. Fundamental to this patent is the measurement of TiOCl_2 after the passivation of AlCl_3 .

As discussed the above references alone, or in combination, do not teach or motivate one skilled in the art, to the use VOCl_3 treatment products ("products") to passivate AlCl_3 . Robinson '022 teaches away from this concept since the text only refers to separation of AlCl_3 using mineral oil, not passivation. Even more important, this reference fails to teach that this separation is capable of capturing all of the AlCl_3 present. The text teaches that only a limited amount of the AlCl_3 present could be "captured" with the addition of the mineral oil. In view of the foregoing, allowance of the above-referenced application is respectfully requested.

Conclusion

In view of the arguments and evidence presented above, Applicant believes all outstanding objections and rejections have been successfully overcome and the application is in condition for allowance. Should anything further be required to place this application in even better form for allowance, the Examiner is cordially invited to telephone the undersigned attorney for Applicant.

Respectfully submitted,

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